

Remarks

Claims 15 - 34 are pending. Claims 21, 22, 29, 30, and 32 - 34 have been allowed. Claim 23 has been objected to. This claim has been written in independent form, and thus should be allowable.

Claim 20 has been amended to recite that R⁴ is phenyl and the aminosilane is free of aniline hydrochloride derivatives.

The subject invention is directed to slow reacting polymers which contain alkoxysilyl groups linked to a urethane or urea group via a "methylene" spacer. These compounds have been prepared by several methods in the past, but all these methods produce products which are extremely reactive in the presence of any moisture. Extreme reactivity is desired in many products, for example isocyanate-free organopolysiloxane foam elastomers. However, these products must first be processed in the manufacturing plant, including operations such as blending with other ingredients such as plasticizers, crosslinkers, solvents, blowing agents, fillers, and the like. The extreme reactivity of the products has severely hampered efforts to use them. It is highly impractical, for example, to operate a blending facility or packaging facility at 0% relative humidity. It is also expensive and time consuming to remove all traces of water from other ingredients. For these reasons, at the time of the prior art, methylene-spaced products had not been made commercially available as far as is known.

Applicants had synthesized such polymers in the past, but were dissatisfied with processing difficulties attributable to the extreme reactivity, and were subsequently exceptionally surprised to find that if sterically unhindered acids and bases are scrupulously removed (or carefully neutralized) during and following polymer preparation, the same polymers are slow to react, similar to the slow reactivity of analogous polymers where the alkoxysilyl group is attached to the urea or urethane linkage by a propyl spacer. Such propyl-spaced alkoxysilane-terminated polymers have been available commercially for many years, but their commercial value was limited due to their slow cure. If traces of acids or bases are

added to the latter slow reacting polymers, some increase in reactivity occurs, but the compositions are still slow to cure. Large amounts of crosslinkers such as tetraethoxysilane (tetraethylorthosilicate) and large amounts of water are additionally necessary. The compositions generally use tin catalysts rather than acidic or basic species for this reason. This is why, for example, that such polymers have proven unsuccessful in producing commercially viable polyorganosiloxane foams. However, the reactivity of the slow reacting, base- and acid-free methylene spaced polymers is tremendously accelerated by addition of acid or base, even small quantities. The reactivity is measured by determining the skin formation time by reaction with water present in the ambient atmosphere at 50% relative humidity.

This discovery facilitates commercial use of the products. The fast reacting polymers of the prior art could not be used with water scavengers, for example, since the polymers were far faster reacting than the scavengers. Thus, for example, when conventional fillers, which always contain traces of water, were admixed with a mixture of polymer and scavenger, the polymer reacted, leaving a polymer-depleted and scavenger containing mixture, not what is desired. However, following Applicants' discovery, the slow reacting polymers and the scavenger can be mixed with filler, and now the scavenger will react, removing traces of water. Complete blending can take place even in humid environments. At the last stage, acid or base can be added and mixed. Only at this point must humidity be carefully excluded. Since there is no water present (it has been scavenged), a fast curing (upon exposure to moisture) composition is created.

Claims 15 - 20, 24 - 28, and 31 have been rejected under 35 U.S.C. § 102(b) over *Golitz* U.S. 3,676,478 ("*Golitz*") with *Müller* 5,118,290 as "evidence". It should be noted that *Golitz* is equivalent to DE 18 12 562 which is discussed on pages 4 and 5 of the present specification, which indicates that the processes for polymer preparation disclosed in *Golitz* only produce polymers with skin formation times well less than 5 minutes ($< < 5$ min) at 50% relative humidity at 23°C. the reason for this high reactivity is evident to one skilled in the art following Applicants' discovery: the preparation processes of the prior art retain traces of sterically unhindered acids or bases. In the case of *Golitz*, these are traces of

unreacted aminosilanes. Applicants' have carefully studied the polymers of *Golitz*, as described on pages 4, 5, and 7 of the specification. These polymers all had a skin formation time $< < 5$ minutes at 50% relative humidity at 23°C. Thus *Golitz* does not disclose any polymers having a skin formation time > 40 minutes.

To illustrate, in Example 5 of the subject invention, a polymer was prepared by first synthesizing an isocyanate-terminated polyether prepolymer by reacting polypropylene glycol with toluene diisocyanate. To the isocyanate-terminated prepolymer was subsequently added 2,2-dimorpholinyl ether (DMDLS) a hindered amine. The purpose of the DMDLS is to neutralize traces of anilinium hydrochloride in the N-phenylaminomethyltrimethoxysilane. The latter was carefully prepared, and not only was the anilinium hydrochloride precipitate formed during its preparation carefully separated, the compound was further purified by dissolving in toluene, causing further anilinium hydrochloride salt to precipitate, giving a product with a very low (*ca.* 100 ppm) chloride content. However, even this exceptionally small content of anilinium hydrochloride is sufficient to cause the polymer prepared therefrom to be extraordinarily reactive. Following reaction with N-phenylaminomethyltrimethoxysilane, a polymer with trimethoxysilyl end groups linked to N-phenylurea groups by a methylene spacer results. The polymer is very slow reacting, exhibiting a skin formation time of > 2 hours at 23°C and 50% RH. It can be easily handled, dispensed, and compounded. However, the addition of only 0.5 weight percent of aminopropyltrimethoxysilane or 1,8-diazabicyclo[5.4.0]undec-7-ene, both unhindered bases, causes the skin formation time to be reduced to *ca.* 1 minute!

To show the importance of eliminating the residual anilinium hydrochloride (the latter, being a salt of a strong acid and weak base, is a sterically unhindered acid), the same preparation was used in Comparative Example 1 which was used in Example 5, but the DMDLS was omitted. The resulting polymer, due to the small traces of anilinium hydrochloride present, has a skin formation time of < 1 minute at 23°C and 50% RH! The reaction time is so fast that it cannot be recognizably altered by adding further catalysts.

Note that the synthesis of the N-phenylaminomethyltrimethoxysilane involves the reaction of excess aniline with chloromethyltrimethoxysilane. This is the same type of synthesis used by *Golitz* in preparing his aminomethylalkoxysilanes. *See, e.g.* column 2, where *Golitz* describes the reaction of excess amine with a chloro- or bromomethylsilane. Thus, one skilled in the art would expect these aminomethylsilanes to have a similar amine hydrochloride content, or even greater, than that prepared by Applicant. These facts and Example 5 and Comparative Example 1 demonstrate, as Applicants have stated on page 7 of the application, that all of the *Golitz* polymers exhibit skin formation times of well less than 5 minutes, as stated on page 5.

The test for anticipation is one of strict identity. *Trintec Industries, Inc. v. TOP U.S.A. Corporation* 63 USPQ 2d 1597 (Fed. Cir. 2002). Even the smallest departure from strict identity renders the claimed invention novel. Here, *Golitz* is silent regarding the skin formation times of his polymers. There is no disclosure at all of any skin formation time. The absence of a claim requirement in a prior art reference prevents the reference from being used to defeat novelty. *In re Evanega* 4 USPQ 2d 1249 (Fed. Cir. 1987).

Nor can the rejection be maintained based on principles of inherency. Mindful of the strict identity test for anticipation, the same requirements apply to rejections based on inherency. In rejections based on inherency, the inherency must be certain, *Ex parte McQueen*, 123 USPQ 37 (POBA 1958), *Ex parte Cyba*, 155 USPQ 756 (POBA 1966); and must be a necessary result, and not merely a possible result. *Ex parte Keith*, 154 USPQ 320 (POBA 1966). Recent Federal Circuit cases have re-echoed these principles, requiring that missing descriptive material be “necessarily present” and not merely “probably” or “possibly” present, *In re Robertson*, 49 USPQ2d 1949 (Fed. Cir. 1999), and as stated previously, must meet a “strict identity test” for anticipation. *Trintec Industries, Inc. v. Top-U.S.A. Corporation*, 63 USPQ2d 1597 (Fed. Cir. 2002).

Here, a skin formation time of > 40 minutes is clearly not a “certain” or “necessary” result in view of the *Golitz* disclosure. Moreover, it is not even a possible result.

Golitz prepared his alkoxysilylmethylurea-terminated polymers in exactly the same manner as in Applicants' Comparative Example 1, and thus, if inherency applies at all, the *Golitz* polymers would be expected to have similar skin formation times, i.e. < 1 minute, and not the > 40 minutes required by the claims. Such polymers are intractable for handling, compounding, etc. As Applicants have indicated, all the *Golitz* polymers have skin formation times of < 5 min. A rejection based on inherency cannot be maintained.

Müller has been cited for the proposition that adding a catalyst will shorten the skin formation time. However, Müller does not support this proposition. First, Müller employed only alkoxysilylpropyl terminated compounds, not alkoxysilylmethyl compounds. The effects of catalysts on these different compounds cannot be compared. The polymers are as different as apples and oranges. For example, tin catalysts are well known for accelerating the moisture cure of alkoxysilylpropyl-terminated polymers. However, as stated on page 13 of the specification, Applicants have found that tin catalysts catalyze the alkoxysilylmethyl polymers either very poorly or not at all.

Second, Müller does not report any skin formation times, and it is expected that had he done so, even a catalyzed polymer would not exhibit a reduced skin formation time of < 20 minutes, as claimed. The compositions of Müller are cured by blending his alkoxysilylpropyl-terminated polymer with tetrathoxy silane crosslinking agent (to speed cure and to increase modulus of cured polymer by numerous crosslinks (TES is tetrafunctional)), and by emulsifying in water containing strong acid. Even with this very great amount of water, the compositions cured to an elastomer in 3 - 5 minutes (Example 5, 6). Cure of an alkoxysilane with atmospheric moisture is far different than cure by dispersing the alkoxysilane in water. The atmosphere at 50% relative humidity contains but very little water. If Müller had measured skin formation time of neat polymer, some relevancy might apply. However, he did not do so.

One skilled in the art would conclude that Müller does not disclose catalysis of alkoxysilylmethyl-terminated polymers, nor does he disclose any composition which, free of

unhindered acids and bases has a skin formation time at 50% RH and 23°C > 40 minutes, and which in the presence of small amounts of acids and bases has a reduced skin formation time of < 20 minutes.


Applicants have discovered a tremendously commercially useful invention. Through the use of Applicants' invention, exceptionally high reactivity can be exploited during moisture cure, while very low reactivity can be exploited during manufacture, handling, compounding, etc, truly "the best of both worlds." Water scavengers can be used, for example, which was previously impossible, and even urethane-linked prepolymers which require a tin catalyst in their preparation can be used for preparation of the slow reacting methylene-spaced polymers, since the tin compounds fail to significantly catalyze the reaction of the alkoxysilylmethyl groups, whereas addition of very small amounts of unhindered acids and bases dramatically increase skin formation time. For this useful and surprising advance in commercially useful technology, Applicants deserve to be rewarded for this efforts. Withdrawal of the rejection of the claims under 35 U.S.C. § 102(b) is therefore solicited.

Applicants submit that the claims are now in condition for Allowance, and respectfully request a Notice to that effect. If the Examiner believes that further discussion will advance the prosecution of the Application, the Examiner is highly encouraged to telephone Applicants' attorney at the number given below.

The Petition Fee of \$120.00 and extra claim fee of \$ 200.00 is being transmitted electronically herewith. Please charge any additional fees or credit any overpayments as a result of the filing of this paper to our Deposit Account No. 02-3978.

Respectfully submitted,

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